Internal Devaluation and Macroeconomic Adjustment: Lessons from the Great Recession in the US

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> "Suppose that a vast housing boom leads to full employment and rising wages in part, but only part, of a currency area, then goes bust. The legacy of those boomtime wage increases will be an uncompetitive tradable sector, and hence the need to get at least relative wages down again." (Krugman 2012)

1 Introduction

According to standard theory, adjustment in relative prices and wages in response to asymmetric (supply and demand) shocks is a key adjustment mechanism in a currency area. Without the option to rely on the nominal exchange rate, "internal devaluation" can nonetheless ensure full employment and macroeconomic stability across states, regions and sub regional areas. Not surprisingly, the topic has become a core issue in the policy debate in the euro area, whereas insufficient relative price (i.e. real exchange rate) adjustment has been singled out as a primary cause for persistent underemployment and instability in some countries. But internal devaluation is not just of interest for academic and policy studies of monetary unions. From a theoretical perspective, the mechanism rests on the tenet that there exists a stable link between wage and price inflation and measures of slack in labor and product markets. In other words, there are wage and price Phillips curves operating not only at aggregate, union-wide, level, but also at disaggregated, state and regional, level. In this sense, understanding internal devaluation can provide valuable insight on a defining issue in macroeconomics.

Indeed, several recent contributions have argued that regional business cycles can shed new light on the amplification forces of aggregate business cycles (see, e.g., Nakamura Steinsson (2014) on fiscal policy, Beraja, Hurst and Ospina (2016) on Phillips curves, going back to the seminal paper by Blanchard and Katz (1992)). Historical episodes of boom and bust are natural candidates for empirical work on the issue. Mian, Rao and Sufi (2013), Mian and Sufi (2014), Kaplan, Mitman and Violante (2016), among others, have shown that the housing price boom and bust in part of the US in the period 2006-2011 has been associated with asymmetric demand and employment and booms and busts. A number of contributions have provided evidence on wages and prices in the wake of large and asymmetric housing shocks, documenting adjustment in overall regional nominal wages (Mian and Sufi (2014)), or tracing the response of retail prices (see, e.g., Kaplan et al. (2016) and Stroebl and Vavra (2014)).

In this paper we contribute to this literature by carrying out a systematic reconsideration of the evidence on price, wage and employment adjustment across US jurisdictions in response to the housing price cycle during the Great Recession. Relative to previous contributions, we offer a richer, insightful decomposition of real exchange rate adjustment by sectoral relative prices, and relate sectoral relative price adjustment to its determinants in terms of relative sectoral wages (cost) and employment (slack) dynamics. To do so, we exploit a new dataset of regional consumer price levels, the BEA Regional Price Parity data. Importantly, combining this dataset with regional data on sectoral wages and employment allows us to obtain a refined and rich decomposition of internal devaluation adjustment by sectors of interest. To disentangle the effects of housing price shock on the variables of interest, we borrow from the literature and focus on a high detail of geographical disaggregation, namely US Metropolitan Statistical Areas (henceforth MSAs). These areas can be thought of as very small open economies, fully integrated in the aggregate system comprising the national US goods and financial markets. Given that trading frictions in these markets are relatively contained, MSAs provide an ideal laboratory to look at the adjustment mechanism through relative wages and prices.

Our main findings are as follows. Over the period 2008-2013, asymmetric housing price shocks were virtually uncorrelated with relative consumption prices across MSAs. Overall, real exchange rates (by definition, the relative price of consumption) across MSAs depreciated by very little in response to asymmetric (and large) negative shocks to housing prices. Decomposing the real exchange rate into its components, we show that the depreciation in the aggregate real exchange rate was mostly driven by the relative market price of rents.[1] These fell sharply in response to negative housing price shocks. Conversely, the response in the relative prices of goods and services was much contained and, strikingly, the adjustment went in opposite directions. The relative price of consumption goods fell with housing prices, while the relative price of services increased, with roughly identical elasticities—basically offsetting the effect of each other movements on the real exchange rate.

In our second set of findings, we document the lack of adjustment in nominal wages in all sectors, including distribution and construction, with the possible exception of a mild (marginally significant) negative response in manufacturing wages, going in the opposite direction of both housing prices and consumption goods prices. This finding is at odds with the evidence of large responses in employment, all in the direction of a contraction following a fall in housing prices, across all sectors—again with the exception of employment in manufacturing, similarly in Mian and Sufi (2014), whereas the response is not statistically significant. In principle our evidence on wages can be reconciled with textbook macroeconomic models assuming a very flat wage Phillips curve and/or recent models with downward nominal wage rigidities (see Schmidt-Grohe and Uribe (2015)). But it is harder to reconcile with our first set of findings, including the counterintuitive response of the relative price of services, that increased in response to a fall in housing prices. In light of standard price Phillips curve models, similarly to Stroebl and Vavra (2014), our findings point to a potentially important role for adjustment in firms' markup.

[1] In our data set, prices of rents are only based on actual market prices and there are no owner imputed rent prices. Therefore, the response of rents represent the actual market response to housing prices.

We proceed in two steps. First, we replicate with publicly available data the findings by Mian and Sufi (2014) on the effects of housing prices on population, sectoral employment and wages across MSAs—this is similar to what Kaplan et al. (2016) do with respect to the findings by Mian, Rao and Sufi (2013) on local consumption. We confirm that in those MSAs where the housing price bust in 2008-2013 was more pronounced, employment also fell relatively more not only in the construction sector, but also in the "nontradable" sector (as defined by Mian and Sufi (2014)). Conversely, employment in the "tradable" (manufacturing) sector was not affected differentially. We also confirm that overall population as well as nominal wages in "tradables" and "nontradables" (and even in construction) were uncorrelated with asymmetric housing price shocks — Mian and Sufi (2014) do not distinguish nominal wage dynamics across sectors.

Second, we document the responses of (i) consumer prices, and (ii) nominal and real (consumption) wages and (iii) employment, distinguishing across the goods and services sectors (detailing specifically distribution). As consumer prices and their sub-components for goods, services and market rents are provided in the RPP dataset, we aggregate employment and wages across industries to match as close as possible their price counterparts. It is worth emphasizing that our aggregation is quite different (and more general and inclusive than) Mian and Sufi (2014).

Finally, we provide novel evidence that both per-capita real GDP and personal income were positively correlated with asymmetric housing price shocks.

This paper is organized as follows. In section 2 we will draw on open economy macro to derive a theoretical framework linking internal devaluation to Phillips Curves theory. In section 3, we present our empirical model and describe our data in details. In section 4 we present and discuss our main result. Section 5 concludes deriving policy implications.

2 The theoretical mechanism: internal devaluation and relative Phillips Curves

To shed light on internal devaluation, in this section we discuss the theoretical underpinning of the real exchange rate across states and regions sharing the same currency. Our starting point is the definition of the real exchange rate across two locations l as the relative price of consumption in the two locations. Since the consumption bundle includes both tradables and nontradables, or, from a different perspective, goods and services, we can naturally perform decompositions of the real exchange rate along one of these lines. To wit, the following is a decomposition of the (log) real exchange rate (ex-rents) for location l as a function of the relative price of goods $(p^l_{G,t} - p_{G,t})$ and services $(p^l_{S,t} - p_{S,t})$.

$$q^l_t = (1 - \alpha_S)\left(p^l_{G,t} - p_{G,t}\right) + \alpha_S\left(p^l_{S,t} - p_{S,t}\right), \tag{1}$$

where α_S is the share of services, for simplicity assumed to be the same for all l. The price of goods at consumer level can be further decomposed as a combination of the price of (tradable) manufacturing $p^l_{T,t}$, and the price of (nontradable) distribution services, $p^l_{NT,t}$, required to bring the goods to consumers (see Corsetti and Dedola (2005)), namely:[2]

$$p^l_{G,t} = (1 - \delta)\, p^l_{T,t} + \delta p^l_{NT,t}, \tag{2}$$

where δ is the distribution share. For future reference, define the relative price of goods, tradable manufacturing, services and distribution as, respectively, $\widehat{\mathcal{T}}^l_{G,t} = \left(p^l_{G,t} - p_{G,t}\right)$,, $\widehat{\mathcal{T}}^l_{T,t} = \left(p^l_{T,t} - p_{T,t}\right)$, $\widehat{\mathcal{T}}^l_{S,t} = \left(p^l_{S,t} - p_{S,t}\right)$ and $\widehat{\mathcal{T}}^l_{N,t} = \left(p^l_{NT,t} - p_{NT,t}\right)$.

In order to link these relative prices to their determinants, we rely on standard NK Phillips Curves. We start by writing inflation in sector $j = T, N, S$ in location l, $\pi^l_{j,t} = p^l_{j,t} - p^l_{j,t-1}$ as a function of expected inflation and current *real* marginal costs (in terms of the aggregate price level p_t) $\widehat{mc}^l_{j,t}$:

$$\pi^l_{j,t} = \beta E_t \pi^l_{j,t+1} + \kappa^l_j \left[\widehat{mc}^l_{j,t} - \left(p^l_{j,t} - p_t\right) + \widehat{\mu}^l_{j,t}\right], \tag{3}$$

where $\widehat{\mu}^l_{j,t}$ is an unobservable component in markup or marginal cost.

For each sector j, we then express local inflation as the differential from the Phillips Curve for aggregate inflation in the same sector $\pi_{j,t}$

$$\begin{aligned} \pi^l_{j,t} - \pi_{j,t} &= \beta E_t\left(\pi^l_{j,t+1} - \pi_{j,t+1}\right) + \kappa^l_j\left[\widehat{mc}^l_{j,t} - \widehat{\mathcal{T}}^l_{j,t} - \widehat{mc}_{j,t} + \widehat{\mu}^l_{j,t} - \widehat{\mu}_{j,t}\right] + \\ &\quad \left(\kappa^l_j - \kappa_j\right)\left[\widehat{mc}_{j,t} + \widehat{\mu}_{j,t}\right]. \end{aligned} \tag{4}$$

[2] Mian-Sufi (2014) dubbed the manufacturing and distribution sectors "tradables" and "nontradables".

This expression establishes that, for each sector j, inflation differentials across location are given by the discounted sum of (i) the expected differential in the real marginal cost in terms of the aggregate price level $\left(\widehat{mc}_{j,t+s}^{l} - \widehat{\mathcal{T}}_{j,t+s}^{l} - \widehat{mc}_{j,t+s}\right)$, (ii) the expected differential in the markups $\left(\widehat{\mu}_{j,t+s}^{l} - \widehat{\mu}_{j,t+s}\right)$, and (iii) the differential in the slope of the Phillips curve $\left(\kappa_j^l - \kappa_j\right)\left(\widehat{mc}_{j,t+s} + \widehat{\mu}_{j,t+s}\right)$:

$$\begin{aligned}\pi_{j,t}^{l} - \pi_{j,t} \quad &= \quad \kappa_j^l \sum_{s=0}^{\infty} \beta^s E_t \left[\left(\widehat{mc}_{j,t+s}^{l} - \widehat{\mathcal{T}}_{j,t+s}^{l} - \widehat{mc}_{j,t+s}\right) + \left(\widehat{\mu}_{j,t+s}^{l} - \widehat{\mu}_{j,t+s}\right)\right] + \\ &\quad \left(\kappa_j^l - \kappa_j\right) \sum_{s=0}^{\infty} \beta^s E_t \left[\widehat{mc}_{j,t+s} + \widehat{\mu}_{j,t+s}\right]. \qquad (5)\end{aligned}$$

It is reasonable to expect that, conditional on a fall in housing prices, a positive inflation differential (causing real appreciation) would mainly result from conditionally higher relative marginal costs or markups—since it is unlikely that the PC slope differential be correlated with housing prices across jurisdictions.

It is instructive to solve directly for the relative price $\widehat{\mathcal{T}}_{j,t}^{l}$:

$$\widehat{\mathcal{T}}_{j,t}^{l} - \widehat{\mathcal{T}}_{j,t-1}^{l} = \beta E_t \left(\widehat{\mathcal{T}}_{j,t+1}^{l} - \widehat{\mathcal{T}}_{j,t}^{l}\right) + \kappa_j^l \left[\widehat{mc}_{j,t}^{l} - \widehat{\mathcal{T}}_{j,t}^{l} - \widehat{mc}_{j,t} + \widehat{\mu}_{j,t}^{l} - \widehat{\mu}_t\right] + \left(\kappa_j^l - \kappa_j\right)\left[\widehat{mc}_t + \widehat{\mu}_t\right];$$

this is an expectational second order difference equation in the price level:

$$\begin{gathered}\beta E_t \left(\widehat{\mathcal{T}}_{j,t+1}^{l} - \widehat{\mathcal{T}}_{j,t}^{l}\right) - \left(\widehat{\mathcal{T}}_{j,t}^{l} - \widehat{\mathcal{T}}_{j,t-1}^{l}\right) - \kappa_j^l \widehat{\mathcal{T}}_{j,t}^{l} = \\ -\kappa_j^l \left[\widehat{MC}_{j,t}^{l} - \widehat{MC}_{j,t} + \widehat{\mu}_{j,t}^{l} - \widehat{\mu}_t\right] - \left(\kappa_j^l - \kappa_j\right)\left[\widehat{mc}_t + \widehat{\mu}_t\right],\end{gathered}$$

where now $\widehat{MC}_{j,t}^{l} - \widehat{MC}_{j,t}$ is the marginal cost differential in *nominal* terms. The above equation has the following general solution:

$$\begin{aligned}\widehat{\mathcal{T}}_{j,t}^{l} \quad &= \quad \nu_1 \widehat{\mathcal{T}}_{j,t-1}^{l} + \kappa_j^l \sum_{s=0}^{\infty} \nu_2^{-s-1} E_t \left[\left(\widehat{MC}_{j,t+s}^{l} - \widehat{MC}_{j,t+s}\right) + \left(\widehat{\mu}_{j,t+s}^{l} - \widehat{\mu}_{j,t+s}\right)\right] \qquad (6) \\ &\quad \left(\kappa_j^l - \kappa_j\right) \sum_{s=0}^{\infty} \nu_2^{-s-1} E_t \left[\widehat{mc}_{j,t+s} + \widehat{\mu}_{j,t+s}\right]\end{aligned}$$

where $0 < \nu_1 < 1 < \beta^{-1} < \nu_2$ solve the standard characteristic equation:

$$\beta \nu^2 - \left[1 + \beta + \kappa_j^l\right] \nu + 1 = 0,$$

namely

$$\nu_i = \frac{1+\beta+\kappa_j^l \pm \sqrt{[1+\beta+\kappa_j]^2 - 4\beta}}{2\beta}.$$

The equation for $\widehat{\mathcal{T}}_{j,t}^l$ is at the heart of the "internal devaluation" adjustment mechanism. Asymmetric shocks affecting relative *nominal* marginal costs will be absorbed through movements in relative prices, with a speed dictated by the slope of the local and sector specific Phillips curve κ_j^l. As already mentioned, to the extent that the PC slope differential is uncorrelated with housing prices, an appreciation in the relative price $\widehat{\mathcal{T}}_{j,t}^l$ conditional on an asymmetric boom in housing prices results from conditionally higher relative *nominal* marginal costs and/or markups.

Assuming that nominal wages are a good proxy for nominal marginal costs, the testable implication is that appreciation in the relative price $\widehat{\mathcal{T}}_{j,t}^l = \left(p_{j,t}^l - p_{j,t}\right)$ can result from an expected increase in relative nominal wages. Indeed, the bulk of the literature on the NKPC assumes that nominal marginal costs are equal to nominal wages $(w_{j,t}^l)$ adjusted by the nominal marginal product of labor $(MPL_{j,t}^l)$:

$$\widehat{MC}_{j,t}^l = w_{j,t}^l - MPL_{j,t}^l.$$

In turn, the latter is assumed to be a function of measures of the "employment gap," namely, deviations of employment from its flexible-price (potential) level; the exact relation can also account for the presence of nominal wage rigidities (see e.g., Galí textbook and Beraja et al. 2016 for a regional application).

It it worth stressing that, in going from theory to our empirical application, we will focus on measures of real exchange rates excluding rents. We exclude market rents because, being directly related to housing market prices, it is unlikely that their dynamics and determinants obey a Phillips Curve relationship of the kind we use for goods and services. This will be a key maintained assumption throughout our study.

3 Empirical approach

In our empirical investigation, we estimate the elasticity of relative price parities, local wages and employment to shocks to local house prices. Our empirical model follows closely Mian, Rao and Sufi (2013) and Mian and Sufi (2014). All regressions are run at the MSAs level of geographical disaggregation. We run an ordinary least squares (OLS) specification and an instrumental variable (IV) one. Our baseline strategy consists of regressing the log-level of the dependent variable on the log-level of local house prices, controlling for other MSA observables.

Our OLS regression specification can be formally expressed as:

$$y_{l,t} = \alpha_l + \gamma_t + \beta \cdot hp_{l,t} + \theta X_{l,t} + \varepsilon_{l,t}, \tag{7}$$

where $y_{l,t}$ is the log of the dependent variable in the MSA l in year t, α_l and γ_t are MSAs and years fixed effects respectively, $hp_{l,t}$ is the MSA log of house prices, $X_{l,t}$ is a matrix of demographic controls, and $\varepsilon_{l,t}$ is an error term. In our main analysis, the dependent variables are the log of MSA consumer price levels $p^l_{j,t}$, in each sector $j = G, S, NT$; the log of nominal (and real consumption) wages $w^l_{j,t}$, again for each sector $j = T, S, NT$, and the log of sectoral employment. We also look at additional variables, including population, real GDP and personal income at MSA level, and we use our data to reproduce the estimates for the same sectoral aggregations in Mian and Sufi (2004). Because we include the time fixed effects γ_t, the coefficient of interest β yields the elasticity of $y_{l,t}$ to $hp_{l,t}$ in deviations from their cross-sectional means. By way of example, when the dependent variable is $p^l_{j,t}$, β can be effectively interpreted as the elasticity of the relative price $\widehat{\mathcal{T}}^l_{j,t} = \left(p^l_{j,t} - p_{j,t}\right)$ to $hp_{l,t} - hp_t$.

In order to address possible endogeneity issues in using $hp_{l,t}$, we rely on an instrumental variable model closely following Mian and Sufi (2014). Namely, we instrument $hp_{l,t}$ using the estimates of housing supply elasticities from Saiz (2010) interacted with a time-varying variable. The Saiz (2010) instrument is provided at the MSA level, and is not available for all of the MSAs. Therefore, we report OLS estimates only for the MSAs covered by Saiz (2010) data. Our OLS results are insensitive to this choice. Regional consumer price levels are from the Regional Price Parity dataset; employment and wage data are from the Census County Business Patterns dataset.

4 Evidence on (the lack of) internal devaluation

Our (preliminary) empirical results are shown by Tables 1 through 21. To summarize our main results, we focus on Tables 5, 11 and 15. As shown in the Table 15, we find that the consumption goods relative price $\widehat{\mathcal{T}}^l_{G,t} = \left(p^l_{G,t} - p_{G,t}\right)$ is positively correlated with asymmetric shocks to housing prices, while the relative price of services $\widehat{\mathcal{T}}^l_{S,t} = \left(p^l_{S,t} - p_{S,t}\right)$ is negatively correlated with these shocks (Table 15), with similar elasticities, equal to .07 and -0.08, respectively (both statistically significant). Hence, the relative prices of goods and services (ex-rent) appear to respond in different directions, with similar intensity, possibly offsetting each other's effect on the real exchange rate.

The relative price of market rents is instead strongly and positively correlated with housing price shocks, with an elasticity equal to 0.13. It is because of this strong response of market rents that the overall relative prices of consumption (the MSA consumption real exchange rate) displays a small positive correlation with housing price shocks.

The estimates in Table 15 are not easy to reconcile with the lack of dynamics of nominal wages, reported in Table 5 and 11 for different levels of disaggregation. It is important to note that while we only observe the overall consumer price of goods $p^l_{G,t} = (1-\delta)\, p^l_{T,t} + \delta p^l_{NT,t}$, and not its individual components $p^l_{T,t}, p^l_{NT,t}$, our data on nominal wages disaggregated across tradables (manufacturing) and nontradables distribution sector do provide some information on the (cost) determinants of both $p^l_{T,t}$ and $p^l_{T,t}$.

Here are our key findings. Wages are correlated with asymmetric housing price shocks only in the tradable sector, but with the (wrong) negative sign (a fall in housing prices tends to raise relative wages). In our preferred estimates in Table 11 for 'goods', based on aggregations of two digit sectors, the elasticity is marginally significant and equal to -0.18. In the distribution and services sectors, instead, relative nominal wages are uncorrelated with housing shocks: points estimates are small (at times negative) and insignificant. It is worth emphasizing that the correlation is insignificant (though the point estimate is positive) even for relative nominal wages in the construction sector.

The lack of response of nominal wages is striking vis-á-vis the response of sectoral employment, as already pointed out by Mian and Sufi (2014).

The empirical evidence confirming these authors' results on employment and wages in our data is shown in Tables 2 and 4. In our contribution, however, we can refine the evidence using different level of disaggregation — these authors do not distinguish wage dynamics across sectors

As shown in Tables 3 and 9, we find that relative employment is positively and significantly correlated with housing prices shocks in all sectors but manufacturing—including services, distribution and construction sectors. The point estimate for the manufacturing sector is positive but insignificant in our IV model, similarly to the finding in Mian and Sufi (2014).

5 Concluding remarks

The evidence for a mature currency area, such as the US, suggests that, with the exception of rents, there has been virtually no internal relative price adjustment during the crisis. While this lack of adjustment may have affected the length of the recession, it has prevented neither recovery at national level, nor rebalancing across states and regional convergence along the recovery.

The evidence on the lack of adjustment at geographically disaggregated level in the US raises important issues in this European debate. Insufficient real exchange rate adjustment has been singled out as a major factor hampering recovery in Europe and keeping the countries in the periphery, worst hit by the crisis, in a persistent state of underemployment. Estimates of the real exchange rate depreciation required to restore full employment vary widely, often as high as 30 percent.

A key question is whether, similarly to the US, relative price adjustment may not be a key margin for full employment across the euro area—a conclusion which would not be warranted given the evidence of an ongoing correction (whether or not deemed sufficient) in Europe. A conjecture consistent with the evidence is that the need for relative price adjustment could be stronger in monetary unions, like the euro area, which lack sufficiently developed institutions and adjustment mechanisms—e.g., a common fiscal and monetary policy targeting an appropriate macroeconomic stance at aggregate level, so to contain the persistence of recessions; fiscal transfers and market-based instruments enhancing risk sharing; a financial policy effective in containing the effects of systemic financial crisis and prevent disruptive economic and financial fragmentation.

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Population

Table 1: Effect of house price change on total population.

	Population	
	OLS	IV
Log House Prices	-0.02	-0.02
	[0.32]	[0.32]
Observations	896	896
R^2	0.01	0.01

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. “OLS” refers to Ordinary Least Squares. “IV” refers to Instrumental Variables. “FS” refers to the First Stage of the IV (which is the same for all IV regresssions). *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 322. The above regressions refer to the time period 2008-2013. The dependent variable is the percent change in employment (in “Tradable”, “Non tradable”, “Construction”, and “Other” sector). For the “First Stage” regression the dependent variable is the percentage change of the instrument “elasticity”, defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Employment

Table 2: Effect of house price change on change in employment.

	Tradable OLS	IV	Non Tradable OLS	IV	Construction OLS	IV	Other OLS	IV
Log House Prices	-0.00	-0.51	0.15	0.25	0.67	0.76	0.13	0.05
	[0.22]	[0.62]	[0.04]***	[0.11]**	[0.09]***	[0.21]***	[0.05]**	[0.15]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	896	896	896	896	896	896	896	896
R^2	0.21	0.20	0.36	0.35	0.72	0.72	0.15	0.15

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. "OLS" refers to Ordinary Least Squares. "IV" refers to Instrumental Variables. "FS" refers to the First Stage of the IV (which is the same for all IV regresssions). *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 322. The above regressions refer to the time period 2008-2013. The dependent variable is the percent change in employment (in "Tradable", "Non tradable", "Construction", and "Other" sector). For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Employment - Goods and Services

Table 3: Effect of house price change on change in employment.

	Goods		Services		Distribution		Construction	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	0.15	-0.48	0.16	0.10	0.16	0.43	0.67	0.76
	[0.21]	[0.55]	[0.04]***	[0.12]	[0.05]***	[0.16]***	[0.09]***	[0.21]***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	896	896	896	896	896	896	896	896
R^2	0.31	0.30	0.19	0.18	0.40	0.36	0.72	0.72

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. "OLS" refers to Ordinary Least Squares. "IV" refers to Instrumental Variables. "FS" refers to the First Stage of the IV (which is the same for all IV regresssions). *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 322. The above regressions refer to the time period 2008-2013. The dependent variable is the percent change in employment (in "Tradable", "Non tradable", "Construction", and "Other" sector). For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Wages (nominal)

Table 4: Effect of house price change on Wages.

	Tradable		Non Tradable		Construction		Other	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	0.13	-0.50	0.05	0.03	0.05	0.10	0.03	0.03
	[0.14]	[0.35]	[0.03]**	[0.09]	[0.04]	[0.10]	[0.04]	[0.09]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	896	896	896	896	896	896	896	896
R^2	0.10	0.06	0.66	0.66	0.27	0.26	0.38	0.38

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percentage change of the variable specified in the header. For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Wages (nominal) - Goods and Services

Table 5: Effect of house price change on Wages.

	Goods		Services		Distribution		Construction	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	-0.00	-0.41	0.02	0.03	0.07	0.02	0.05	0.10
	[0.11]	[0.30]	[0.04]	[0.09]	[0.04]*	[0.11]	[0.04]	[0.10]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	896	896	896	896	896	896	896	896
R^2	0.17	0.15	0.40	0.40	0.36	0.35	0.27	0.26

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percentage change of the variable specified in the header. For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Wages (real)

Table 6: Effect of house price change on real wages.

	Tradable OLS	IV	Non Tradable OLS	IV	Construction OLS	IV	Other OLS	IV
Log House Prices	0.09	-0.53	0.01	-0.00	0.00	0.06	-0.01	-0.01
	[0.14]	[0.35]	[0.03]	[0.09]	[0.04]	[0.10]	[0.04]	[0.09]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	896	896	896	896	896	896	896	896
R^2	0.05	0.01	0.45	0.45	0.07	0.06	0.12	0.12

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percentage change of the variable specified in the header. For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Wages (real) - Goods and Services

Table 7: Effect of house price change on real wages.

	Goods		Services		Distribution		Construction	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	-0.05	-0.45	-0.02	-0.01	0.03	-0.01	0.00	0.06
	[0.11]	[0.30]	[0.04]	[0.08]	[0.04]	[0.12]	[0.04]	[0.10]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	896	896	896	896	896	896	896	896
R^2	0.09	0.07	0.15	0.15	0.11	0.10	0.07	0.06

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percentage change of the variable specified in the header. For the “First Stage” regression the dependent variable is the percentage change of the instrument “elasticity”, defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Employment - 2 DIGIT LEVEL

Table 8: Effect of house price change on change in employment.

	Tradable		Non Tradable		Construction	
	OLS	IV	OLS	IV	OLS	IV
Log House Prices	0.81	2.12	0.15	0.25	0.86	1.26
	[0.35]**	[1.88]	[0.03]***	[0.06]***	[0.08]***	[0.20]***
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	896	896	896	896	896	896
R^2	0.04	0.02	0.58	0.57	0.75	0.73

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. "OLS" refers to Ordinary Least Squares. "IV" refers to Instrumental Variables. "FS" refers to the First Stage of the IV (which is the same for all IV regresssions). *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 322. The above regressions refer to the time period 2008-2013. The dependent variable is the percent change in employment (in "Tradable", "Non tradable", "Construction", and "Other" sector). For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invaryING as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Employment - 2 DIGIT LEVEL - Goods and Services

Table 9: Effect of house price change on change in employment.

	Goods		Services		Distribution		Construction	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	0.37	0.26	0.13	0.21	0.16	0.25	0.86	1.26
	[0.13]***	[0.23]	[0.03]***	[0.08]***	[0.02]***	[0.07]***	[0.08]***	[0.20]***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	894	894	896	896	896	896	896	896
R^2	0.21	0.21	0.22	0.20	0.75	0.74	0.75	0.73

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. "OLS" refers to Ordinary Least Squares. "IV" refers to Instrumental Variables. "FS" refers to the First Stage of the IV (which is the same for all IV regresssions). *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 322. The above regressions refer to the time period 2008-2013. The dependent variable is the percent change in employment (in "Tradable", "Non tradable", "Construction", and "Other" sector). For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Wages (nominal) - 2 DIGIT LEVEL

Table 10: Effect of house price change on Wages.

	Tradable		Non Tradable		Construction		Other	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	-0.16	-0.11	0.01	-0.03	0.03	0.16	0.01	-0.01
	[0.11]	[0.15]	[0.02]	[0.10]	[0.04]	[0.13]	[0.02]	[0.07]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	892	891	896	896	896	896	896	896
R^2	0.11	0.11	0.62	0.62	0.40	0.39	0.53	0.53

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percentage change of the variable specified in the header. For the “First Stage” regression the dependent variable is the percentage change of the instrument “elasticity”, defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Wages (nominal) - 2 DIGIT LEVEL - Goods and Services

Table 11: Effect of house price change on Wages.

	Goods		Services		Distribution		Construction	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	-0.03	-0.18	-0.00	-0.04	0.04	-0.02	0.03	0.16
	[0.05]	[0.11]*	[0.03]	[0.07]	[0.02]*	[0.07]	[0.04]	[0.13]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	894	894	896	896	896	896	896	896
R^2	0.48	0.47	0.56	0.55	0.65	0.64	0.40	0.39

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percentage change of the variable specified in the header. For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Wages (real) - 2 DIGIT LEVEL

Table 12: Effect of house price change on Wages.

	Tradable		Non Tradable		Construction		Other	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	-0.20	-0.15	-0.03	-0.06	-0.01	0.13	-0.04	-0.05
	[0.11]*	[0.15]	[0.02]	[0.10]	[0.04]	[0.13]	[0.03]	[0.07]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	892	891	896	896	896	896	896	896
R^2	0.06	0.06	0.30	0.30	0.16	0.14	0.20	0.20

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percentage change of the variable specified in the header. For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Wages (real) - 2 DIGIT LEVEL - Goods and Services

Table 13: Effect of house price change on Wages.

	Goods		Services		Distribution		Construction	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	-0.08	-0.21	-0.04	-0.07	-0.00	-0.05	-0.01	0.13
	[0.05]	[0.11]**	[0.03]*	[0.07]	[0.03]	[0.07]	[0.04]	[0.13]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	894	894	896	896	896	896	896	896
R^2	0.30	0.29	0.25	0.24	0.29	0.28	0.16	0.14

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percentage change of the variable specified in the header. For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Personal income and GDP

Table 14: Effect of house price change on Personal Income.

	PI		PI pc		GDP		GDP pc	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	0.08	0.09	0.05	0.09	0.28	0.28	0.25	0.28
	[0.02]***	[0.05]*	[0.02]**	[0.05]*	[0.03]***	[0.07]***	[0.03]***	[0.07]***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	896	896	896	896	896	896	896	896
R^2	0.47	0.47	0.38	0.37	0.30	0.30	0.30	0.30

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percent change in (real) Personal Income (PI), Personal Income per capia (PI cp), Gross Domestic Product (GDP) and Gross Domestic Product per capita (GDP pc), respectively for the first two columns, second two columns, and so on. For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

RPP (RER)

Table 15: Effect of house price change on Regional Price Parities (RPP).

	All		Goods		Services - Other		Services - Rents	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Log House Prices	0.04	0.04	0.02	0.07	0.01	-0.08	0.13	0.13
	[0.01]***	[0.02]*	[0.01]*	[0.02]***	[0.01]	[0.03]***	[0.02]***	[0.06]**
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	896	896	896	896	896	896	896	896
R^2	0.15	0.15	0.10	-0.08	0.08	-0.14	0.27	0.26

Standard errors in brackets
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percent change in Regional Price Paritty (RPP) (for “All items”, “Goods”, “Services - other than rents”, and “Services - rents”). For the “First Stage” regression the dependent variable is the percentage change of the instrument “elasticity”, defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Employment - TIME PERIOD: 2008-2013

Table 16: Effect of house price change on change in employment.

	Tradable		Non Tradable		Construction		First Stage
	OLS	IV	OLS	IV	OLS	IV	OLS
Log House Prices	0.12	0.17	0.08	-0.08	0.65	1.22	
	[0.20]	[1.15]	[0.05]	[0.31]	[0.07]***	[0.35]***	
Instrument							
Elasticity							-0.01
							[0.00]***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1344	1344	1344	1344	1344	1344	1344
R^2	0.08	0.08	0.94	0.94	0.55	0.51	0.45

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. “OLS” refers to Ordinary Least Squares. “IV” refers to Instrumental Variables. “FS” refers to the First Stage of the IV (which is the same for all IV regresssions). *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 322. The above regressions refer to the time period 2008-2013. The dependent variable is the percent change in employment (in “Tradable”, “Non tradable”, “Construction”, and “Other” sector). For the “First Stage” regression the dependent variable is the percentage change of the instrument “elasticity”, defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Wages (nominal) - TIME PERIOD: 2008-2013

Table 17: Effect of house price change on Wages.

	Tradable		Non Tradable		Construction		First Stage
	OLS	IV	OLS	IV	OLS	IV	OLS
Log House Prices	0.01	-0.62	0.10	0.48	0.06	-0.17	
	[0.10]	[0.51]	[0.04]***	[0.18]***	[0.04]	[0.19]	
Instrument							
Elasticity							-0.01
							[0.00]***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1344	1344	1344	1344	1344	1344	1344
R^2	0.14	0.10	0.92	0.90	0.43	0.41	0.45

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percentage change of the variable specified in the header. For the “First Stage” regression the dependent variable is the percentage change of the instrument “elasticity”, defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Wages (real) - TIME PERIOD: 2008-2013

Table 18: Effect of house price change on Wages.

	Tradable		Non Tradable		Construction		Total
	OLS	IV	OLS	IV	OLS	IV	OLS
Log House Prices	-0.02	-0.73	0.07	0.37	0.03	-0.28	
	[0.10]	[0.52]	[0.04]*	[0.19]**	[0.04]	[0.19]	
Instrument							
Elasticity							-0.01
							[0.00]***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1344	1344	1344	1344	1344	1344	1344
R^2	0.04	-0.01	0.88	0.87	0.12	0.06	0.45

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percentage change of the variable specified in the header. For the "First Stage" regression the dependent variable is the percentage change of the instrument "elasticity", defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Personal income and GDP - TIME PERIOD: 2008-2013

Table 19: Effect of house price change on Personal Income.

	PI		PI pc		GDP		GDP pc		First Stage
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	FS
Log House Prices	0.14	0.11	0.09	0.15	0.28	0.57	0.24	0.61	
	[0.03]***	[0.10]	[0.02]***	[0.07]*	[0.03]***	[0.15]***	[0.03]***	[0.14]***	
Instrument									
Elasticity									-0.01
									[0.00]***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1344	1344	1344	1344	1344	1344	1344	1344	1344
R^2	0.69	0.69	0.56	0.56	0.34	0.22	0.23	-0.02	0.45

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percent change in (real) Personal Income (PI), Personal Income per capia (PI cp), Gross Domestic Product (GDP) and Gross Domestic Product per capita (GDP pc), respectively for the first two columns, second two columns, and so on. For the “First Stage” regression the dependent variable is the percentage change of the instrument “elasticity”, defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

RPP (RER) - TIME PERIOD: 2008-2013

Table 20: Effect of house price change on Regional Price Parities (RPP).

	All		Goods		Services - Other		Services - Rents		First Stag
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	FS
Log House Prices	0.03	0.11	0.01	0.10	0.01	-0.09	0.11	0.43	
	[0.01]***	[0.03]***	[0.01]	[0.04]***	[0.01]	[0.04]**	[0.02]***	[0.12]***	
Instrument									
Elasticity									-0.01
									[0.00]***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1344	1344	1344	1344	1344	1344	1344	1344	1344
R^2	0.09	-0.13	0.09	-0.45	0.08	-0.25	0.15	-0.17	0.45

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. *** indicates significance at 1% level, **at 5% * at 10%. All regressions include time and MSA fixed effects. Total number of MSA is 323. The above regressions refer to the time period 2008-2013. The dependent variable is the percent change in Regional Price Paritty (RPP) (for “All items”, “Goods”, “Services - other than rents”, and “Services - rents”). For the “First Stage” regression the dependent variable is the percentage change of the instrument “elasticity”, defined as the interaction between the housing supply elasticity (time-invarying as in Saiz (2011)) and the (time varying) S&P / Case-Shiller house price index.

Baseline - 27 areas

Table 21: Effect of house price change on local prices.

	All		D		ND		S rents		S ex rents		FS
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	FS
Log House Prices	0.12	0.28	0.05	0.16	0.02	0.06	0.30	0.60	-0.14	-0.27	
	[0.02]***	[0.05]***	[0.06]	[0.17]	[0.02]	[0.06]	[0.03]***	[0.10]***	[0.02]***	[0.08]***	
Instrument											
Elasticity											0.03
											[0.01]***
Observations	682	682	682	682	682	682	682	682	682	682	682
R^2	1.00	0.99	0.66	0.63	0.99	0.99	0.97	0.96	0.60	0.48	0.91

Standard errors in brackets
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: robust standard errors clustered by Metropolitan Statistical Area (MSA) in brackets. TBC